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EXAMINER

UMEZ ERONINI, LYNETTE T.

| ART UNIT | PAPER NUMBER |
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1765

DATE MAILED: 07/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/945,508

Applicant(s)

KO, KEI-YU

Examiner

Lynette T. Umez-Eronini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,4-6,9-11,14-16,19,20 and 65-86 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.

- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.

- 6) ☒ Claim(s) 1,4-6,9-11,14-16,19,20 and 65-86 is/are rejected.

- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.

- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 15 & 16. 6) ☐ Other: \_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 66, 75 and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (US 5,908,320) in view of Kuehne et al. (US 6,372,605 B1).

As pertaining to claims 1, 66, 75, and 77, Chu teaches, an etchant source gas that includes Ne, CHF<sub>3</sub>, CO, and C<sub>4</sub>F<sub>8</sub> (Abstract), which reads on, an etchant gas composition comprising:

an inert gas (same as carrier gas), (column 6, lines 44-48);

C<sub>4</sub>F<sub>8</sub>, (column 6, lines 55);

CH<sub>2</sub>F<sub>2</sub> (column 6, lines 55); and

a gas selected from the group consisting of CHF<sub>3</sub>, CF<sub>4</sub>, and mixtures thereof (column 6, line 44-45).

Chu differs in failing to teach at least one of C<sub>4</sub>F<sub>6</sub>, C<sub>3</sub>F<sub>6</sub> and C<sub>5</sub>F<sub>8</sub>, in claim 1; C<sub>4</sub>F<sub>6</sub>, in claim 75; and C<sub>5</sub>F<sub>8</sub>, in claim 77.

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Kuehne teaches other suitable gases can be substituted for the  $C_4F_8$ , include (for example and without limitation)  $C_5F_8$ ,  $C_4F_6$ , or a combination of  $C_4F_8$  and  $CH_2F_2$  (column 6, lines 44-52).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu by substituting  $C_4F_8$  for  $C_4F_6$  or  $C_5F_8$ , as taught by Kuehne for the purpose of selectively etching a silicon oxide layer relative to a silicon nitride layer (Kuehne, column 6, lines 55-60).

2. Claims 4, 5, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu ('320) in view of Kuehne ('605 B1), as applied to claim 1, above, and further in view of Kim et al. (US 6,362,109).

Chu in view of Kuehne differs in failing to teach the etchant composition comprises the carrier gas that is selected from the group consisting of argon, helium, and xenon, **in claim 4** and argon **in claim 5**, and comprises  $O_2$ , **in claim 65**.

Kim teaches an etchant comprising a fluorocarbon and oxygen with a flow of an inactive diluent gas such as argon is well known for etching holes in oxide with high aspect ratios, often with a relatively high selectivity to nitride (column 4, lines 43-46).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu in view of Kuehne by employing an etchant that contains oxygen in addition to a fluorocarbon gas and diluent gas, as taught by Kim for the purpose of selectively etching an oxide layer relative to a nitride layer (Kim, column 4, lines 43-46).

Since the body of a claim sets forth all of the limitations of the claimed invention, and the preamble merely states, for example, "A boron and/or phosphorus doped silicon dioxide selective to undoped  $\text{SiO}_2$  and  $\text{Si}_3\text{N}_4$ " etchant gas composition, the purpose or intended use of the invention, rather than any distinct definition of any of the claimed invention's limitations, then the preamble is not considered a limitation and is of no significance to claim construction. *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165 (Fed. Cir. 1999). No patentable weight is given to "a boron and/or phosphorus doped silicon dioxide selective to undoped  $\text{SiO}_2$  and  $\text{Si}_3\text{N}_4$ " in claim 1.

3. Claims 67 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu ('320) in view of Kuehne ('605 B1), as applied to claim 1, above, and further in view of Fayfield et al. (US 6,065,481).

Chu in view of Kuehne differs in failing to teach the carrier gas comprises helium, **in claim 67** and xenon, **in claim 71**.

Fayfield teaches, "... other carrier gases inert to the etching reaction may also be used, for instance the noble gases helium, neon, argon, krypton or xenon (column 6, lines 17-19).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu in view of Kuehne by replacing the carrier gas with either argon, helium, or xenon, as taught by Fayfield for the purpose of diluting the reactive (etchant) gases.

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4. Claims 6, 78, and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu ('320) in view of Kuehne ('605 B1).

As pertaining to claims 6, 78, and 80, Chu teaches an etchant gas composition comprising:

an inert gas (same as carrier gas), (column 6, lines 44-48);

C<sub>4</sub>F<sub>8</sub>, (column 6, lines 55);

CH<sub>2</sub>F<sub>2</sub> (column 6, lines 55); and

a gas selected from the group consisting of CHF<sub>3</sub>, CF<sub>4</sub>, and mixtures thereof (column 6, line 44-45).

Chu differs in failing to teach at least one of C<sub>4</sub>F<sub>6</sub>, C<sub>3</sub>F<sub>8</sub> and C<sub>5</sub>F<sub>8</sub>, in claim 6; C<sub>4</sub>F<sub>6</sub>, in claim 78; and C<sub>5</sub>F<sub>8</sub>, in claim 80.

Kuehne teaches other suitable gases can be substituted for the C<sub>4</sub>F<sub>8</sub>, include (for example and without limitation) C<sub>5</sub>F<sub>8</sub>, C<sub>4</sub>F<sub>6</sub>, or a combination of C<sub>4</sub>F<sub>8</sub> and CH<sub>2</sub>F<sub>2</sub> (column 6, lines 44-52).). Hence, replacing Chu's C<sub>4</sub>F<sub>8</sub> with Kuehne's C<sub>4</sub>F<sub>6</sub> or C<sub>5</sub>F<sub>8</sub> further reads on an etchant gas composition consisting essentially of: a carrier gas; C<sub>4</sub>F<sub>6</sub>; CH<sub>2</sub>F<sub>2</sub>; and CHF<sub>3</sub>, **as in claim 6.**

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu by substituting C<sub>4</sub>F<sub>8</sub> for C<sub>4</sub>F<sub>6</sub> or C<sub>5</sub>F<sub>8</sub> as taught by Kuehne for the purpose of selectively etching a silicon oxide layer relative to a silicon nitride layer (Kuehne, column 6, lines 55-60).

Since the body of a claim sets forth all of the limitations of the claimed invention, and the preamble merely states, for example, "A boron and/or phosphorus doped silicon

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dioxide selective to undoped  $\text{SiO}_2$  and  $\text{Si}_3\text{N}_4$ " etchant gas composition, the purpose or intended use of the invention, rather than any distinct definition of any of the claimed invention's limitations, then the preamble is not considered a limitation and is of no significance to claim construction. *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165 (Fed. Cir. 1999). No patentable weight is given to "a boron and/or phosphorus doped silicon dioxide selective to undoped  $\text{SiO}_2$  and  $\text{Si}_3\text{N}_4$ " in claim 6.

5. Claims 9, 10, 68 and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu ('320) in view of Kuehne ('605 B1), as applied to claim 6, above, and further in view of Fayfield ('481).

Chu in view of Kuehne differs in failing to teach the etchant composition comprises the carrier gas that is selected from the group consisting of argon, helium, and xenon, **in claim 9**; and argon **in claim 10**; helium, **in claim 68**; and xenon, **in claim 72**.

Fayfield teaches, "... other carrier gases inert to the etching reaction may also be used, for instance the noble gases helium, neon, argon, krypton or xenon (column 6, lines 17-19).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu in view of Kuehne by replacing the carrier gas with either argon, helium, or xenon, as taught by Fayfield for the purpose of diluting the reactive (etchant) gases.

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6. Claims 11, 81, and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu ('320) in view of Kuehne ('605 B1).

As pertaining to claims 11, 81, and 83, Chu teaches an etchant gas composition comprising:

an inert gas (same as carrier gas), (column 6, lines 44-48);

C<sub>4</sub>F<sub>8</sub>, (column 6, lines 55);

CH<sub>2</sub>F<sub>2</sub> (column 6, lines 55); and

a gas selected from the group consisting of CHF<sub>3</sub>, CF<sub>4</sub>, and mixtures thereof (column 6, line 44-45).

Chu differs in failing to teach at least one of C<sub>4</sub>F<sub>6</sub>, C<sub>3</sub>F<sub>6</sub> and C<sub>5</sub>F<sub>8</sub>, in claim 11; C<sub>4</sub>F<sub>6</sub>, in claim 81; and C<sub>5</sub>F<sub>8</sub>, in claim 83.

Kuehne teaches other suitable gases can be substituted for the C<sub>4</sub>F<sub>8</sub>, include (for example and without limitation) C<sub>5</sub>F<sub>8</sub>, C<sub>4</sub>F<sub>6</sub>, or a combination of C<sub>4</sub>F<sub>8</sub> and CH<sub>2</sub>F<sub>2</sub> (column 6, lines 44-52). Hence, replacing Chu's C<sub>4</sub>F<sub>8</sub> with Kuehne's C<sub>4</sub>F<sub>6</sub> or C<sub>5</sub>F<sub>8</sub>, reads on an etchant gas composition consisting essentially of: a carrier gas; C<sub>4</sub>F<sub>6</sub>; CH<sub>2</sub>F<sub>2</sub>; and CF<sub>4</sub>, **as in claim 11.**

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu by substituting C<sub>4</sub>F<sub>8</sub> for C<sub>4</sub>F<sub>6</sub> or C<sub>5</sub>F<sub>8</sub>, as taught by Kuehne for the purpose of selectively etching a silicon oxide layer relative to a silicon nitride layer (column 6, lines 55-60).

Since the body of a claim sets forth all of the limitations of the claimed invention, and the preamble merely states, for example, "A boron and/or phosphorus doped silicon

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dioxide selective to undoped  $\text{SiO}_2$  and  $\text{Si}_3\text{N}_4$ ” etchant gas composition, the purpose or intended use of the invention, rather than any distinct definition of any of the claimed invention’s limitations, then the preamble is not considered a limitation and is of no significance to claim construction. *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165 (Fed. Cir. 1999). No patentable weight is given to “a boron and/or phosphorus doped silicon dioxide selective to undoped  $\text{SiO}_2$  and  $\text{Si}_3\text{N}_4$ ” in claim 11.

7. Claims 14, 15, 69, and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu (‘320) in view of Kuehne (‘605 B1), as applied to claim 11, above, and further in view of Fayfield (‘481).

Chu in view of Kuehne differs in failing to teach the etchant composition comprises the carrier gas that is selected from the group consisting of argon, helium, and xenon, **in claim 14**; argon **in claim 15**; helium, **in claim 69**; and xenon, **in claim 73**.

Fayfield teaches, “. . . other carrier gases inert to the etching reaction may also be used, for instance the noble gases helium, neon, argon, krypton or xenon (column 6, lines 17-19).

It is the examiner’s position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu and Kuehne by replacing the carrier gas with either argon, helium, or xenon, as taught by Fayfield for the purpose of diluting the reactive (etchant) gases.

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8. Claims 16, 84, and 86 are rejected under 35 U.S.C. 103(a) as being unpatentable over ('320) in view of Kuehne ('605 B1).

As pertaining to claims 16, 84, and 88, Chu teaches an etchant gas composition comprising:

an inert gas (same as carrier gas), (column 6, lines 44-48);

C<sub>4</sub>F<sub>8</sub>, (column 6, lines 55);

CH<sub>2</sub>F<sub>2</sub> (column 6, lines 55); and

a gas selected from the group consisting of CHF<sub>3</sub>, CF<sub>4</sub>, and mixtures thereof (column 6, line 44-45), which further reads on CHF<sub>3</sub> and CF<sub>4</sub>.

Chu differs in failing to teach at least one of C<sub>4</sub>F<sub>6</sub>, C<sub>3</sub>F<sub>6</sub> and C<sub>5</sub>F<sub>8</sub>, in claim 16; C<sub>4</sub>F<sub>6</sub>, in claim 84; and C<sub>5</sub>F<sub>8</sub>, in claim 86;

Kuehne teaches other suitable gases can be substituted for the C<sub>4</sub>F<sub>8</sub>, include (for example and without limitation) C<sub>5</sub>F<sub>8</sub>, C<sub>4</sub>F<sub>6</sub>, or a combination of C<sub>4</sub>F<sub>8</sub> and CH<sub>2</sub>F<sub>2</sub> (column 6, lines 44-52).). Hence, replacing Chu's C<sub>4</sub>F<sub>8</sub> with Kuehne's C<sub>4</sub>F<sub>6</sub> or C<sub>5</sub>F<sub>8</sub>, reads on an etchant gas composition consisting essentially of: a carrier gas; C<sub>4</sub>F<sub>6</sub>; CH<sub>2</sub>F<sub>2</sub>; CHF<sub>3</sub>; and CF<sub>4</sub>, **as in claim 16.**

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu by substituting C<sub>4</sub>F<sub>8</sub> for C<sub>4</sub>F<sub>6</sub> or C<sub>5</sub>F<sub>8</sub> as taught by Kuehne for the purpose of selectively etching a silicon oxide layer relative to a silicon nitride layer (column 6, lines 55-60).

Since the body of a claim sets forth all of the limitations of the claimed invention, and the preamble merely states, for example, "A boron and/or phosphorus doped silicon

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dioxide selective to undoped  $\text{SiO}_2$  and  $\text{Si}_3\text{N}_4$  etchant gas composition, the purpose or intended use of the invention, rather than any distinct definition of any of the claimed invention's limitations, then the preamble is not considered a limitation and is of no significance to claim construction. *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165 (Fed. Cir. 1999). No patentable weight is given to "a boron and/or phosphorus doped silicon dioxide selective to undoped  $\text{SiO}_2$  and  $\text{Si}_3\text{N}_4$ " in claim 16.

9. Claims 19, 20, 70, and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu ('320) in view of Kuehne ('605 B1), as applied to claim 16, above, and further in view of Fayfield ('481).

Chu in view of Kuehne differs in failing to teach the etchant composition comprises the carrier gas that is selected from the group consisting of argon, helium, and xenon, **in claim 19**; argon, **in claim 20**; argon, **in claim 70**; and xenon, **in claim 74**.

Fayfield teaches, "... other carrier gases inert to the etching reaction may also be used, for instance the noble gases helium, neon, argon, krypton or xenon (column 6, lines 17-19).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Chu and Kuehne in view Kim of by replacing the carrier gas with either argon, helium, or xenon, as taught by Fayfield for the purpose of diluting the reactive gases.

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10. Claims 76, 79, 82, and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu ('320) in view of Kuehne ('605 B1), as respectively applied to claims 1, 6, 11, and 16 above, and further in view of Ohno et al. (US 5,828,096).

Chu in view of Kuehne differs in failing to teach the etchant gas composition comprising  $C_3F_8$ .

Ohno teaches, "As an etching process of silicon dioxide having a high etching rate with respect to the above-described silicon nitride or silicon oxynitride, a dry etching process using fluorocarbon system gas such as  $c-C_4F_8$ ,  $C_3F_8$ ,  $C_3F_6$ ,  $C_5F_{12}$ ,  $C_4F_8$ ,  $C_5F_{10}$ ,  $CHF_3$  and mixed gas thereof, for example, may be employed. Furthermore, dry etching process using mixed gas of argon Ar, carbon monoxide CO, or oxygen  $O_2$  or the like and fluorocarbon system gas, as well as mixed gas of argon AR, carbon monoxide CO, oxygen  $O_2$  or the like and mixed gas of the above-described fluorocarbon system gases may be employed." (column 6, lines 26-36).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify the etchant composition of Chu in view of Kuehne by using a fluorocarbon gas mixture that includes  $C_3F_6$  as taught by Ohno for the purpose of selectively etching silicon dioxide with respect to silicon nitride (Ohno, column 6, lines 26-31).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

*Lynette T. Umez-Eronini*

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July 15, 2003